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DEC 28 1956

WDTR

SUBJECT: (U) Pied Piper Progress Report for August, MSD 1958 dated 1 September 1956

TO:
Lockheed Aircraft Corporation
Missile System Division
ATTN: Mr. R. M. Salter, Jr.
Post Office Box 504
Sunnyvale, California

1. Reference is made to:

a. Our letter, same subject as above, dated 30 October 1956 (WDTR 56-208) (MSD/18503).

b. Your letter, 7 December 1956, MSD/18563.

2. In reference 1a, we called your attention to an error in calculation contained on page 5 of MSD 1958 which states "if the largest quoted value of 2.4 x 10^6 particles/cm^2/yr is assumed then about 130 of these particles will impinge upon the satellite during the exposure time of 0.01 seconds".

3. In reference 1b, you cite various data to support the use of quoted value (2.4 x 10^6 particles/cm^2/yr) of meteoric flux. This is not germane to the question raised in reference 1a.

4. A simple trial calculation (inclosure 1) indicates an error in concluding that the flux used results in "130 impacts during the 0.01 seconds of exposure time". Using the flux quoted in paragraphs 2 and 3 above, (from MSD 1958) the inclosure calculation gives impacts of the order of 10^{-2} impacts per second or 10^{-4} impacts during 0.01 seconds.

5. If the flux figure of 2 x 10^{-2} particles/cm^2/sec, quoted in paragraph 2, reference 1b, is used then, since the satellite has an external area of approximately 6 x 10^5 cm^2, an impact rate of 1.2 x 10^4 particles/satellite/second or 120 particles/satellite/0.01 sec would result, which agrees with the 130 particles per 0.01 second figure given in MSD 1958. The value of flux of 2 x 10^{-2} particles/

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cm^2/sec attributed to Berg and Meredith in paragraph 2 of reference 1b would be larger than the MSD 1958 value of 2.4 x 10^0 particles/cm^2/year by a factor of over 10^5. Since this office does not yet have access to the results attributed to Berg and Meredith, we cannot assess their applicability.

6. Since, as is stated in MSD 1958, an impact rate of 130 particles per 0.01 seconds could conceivably impart an angular oscillation to the camera in the neighborhood of the tolerance value of 0.00164 milliradians, it is essential that the best available figures of meteoric flux be accurately evaluated and their effect calculated in order that the camera and other components be adequately designed. This initial design cannot await the action indicated in paragraph 3 of reference 1b, although the instrumentation of early satellites should provide data for redesign, should the latter be necessary.

7. Please advise this office of the design data to be employed in this regard.

SIGNED

1 Incl
Trial Calculation
1 pg, 1 cy (S)
(WDTR 56-273)

FREDERIC C. E. ODER
Lt Colonel, USAF
Assistant for WS 117L
Technical Operations

Copy furnished:
AFCRC, CRZVA:820:4C, Mr. Radnor

WDTR 56-273

WDTR
F C E Oder

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Trial Calculation

1. Assume a cylindrical satellite vehicle 7 feet in diameter (d) by 30 feet long (l). (A generous approximation).

$$\begin{aligned} \text{Area of satellite cylinder} &= \pi d l \\ &= \pi\,(7 \times 12 \times 2.54)\,(30 \times 12 \times 2.54)\ \text{cm}^2 \\ &= 6.15 \times 10^5\ \text{cm}^2 \end{aligned}$$

2. One year $= 365 \times 24 \times 60 \times 60$ seconds $= 3.16 \times 10^7$ sec

3. 2.4×10^0 particles $\text{cm}^{-2}\,\text{yr}^{-1}$ (MSD 1958 value)

$$= \frac{2.4 \times 6.15 \times 10^5}{3.16 \times 10^7}\ \text{particles}\cdot\text{satellite}^{-1}\cdot\text{sec}^{-1}$$

$$= 4.7 \times 10^{-2}\ \text{particles}\cdot\text{satellite}^{-1}\cdot\text{sec}^{-1}$$

or of the order of 10^{-4} particles impacting on the satellite during an exposure of 0.01 sec.

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Incl 1

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WDTR

DEC 28 1956

SUBJECT: (U) ARS Progress Report

TO: Commander
Air Force Cambridge Research Center
ATTN: CRZVA:820:LC, Mr. Radner
Cambridge, Massachusetts

1. Reference is made to your letter, same subject, 26 September 1956.

2. Inclosed is our exchange of correspondence with Missile System Division of the Lockheed Aircraft Corporation on this subject which indicates action to date.

3. We appreciate your catching the error in question as it could have serious consequences if left unchallenged.

4. Your comments on the applicability of the date attributed to Berg and Meredith, Naval Research Laboratory, are requested.

5. Please note that the calculations used by Missile System Division of the Lockheed Aircraft Corporation in their report MSD 1956 were made by Dr. George Taylor.

FOR THE COMMANDER:

SIGNED

FREDERIC C. E. ODER
Lt Colonel, USAF
Assistant for WS 117L
Technical Operations

3 Incl
1-ltr fr WDTR to LMSD
30 Oct 56, 1 pg, 1 cy
(WDTR 56-208) (S)
2-ltr fr LMSD 7 Dec 56
1 pg, 1 cy
(MD 56-05119) (S)
3-ltr fr WDTR to LMSD
2 pgs, 1 cy
(WDTR 56-273) (S)

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DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

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WDTR [redacted] WDTR 56-274

F C E Oder